

Title: The Impact of Applications on Mathematics

Speaker: Dr Bob Anderssen

Abstract: The opportunity and appeal that mathematics represents to people solving real-world problems is that it allows a rigorous framework to be defined within which specific matters can be resolved. Ironically, for many applications, the resulting formulation is improperly posed in that the required solution is not the solution of a standard forward (properly posed) problem, but must be chosen from within a non-unique set and/or will be sensitive to small perturbations in the available data. The prototypical examples of the non-uniqueness and the sensitivity are, respectively, geophysical prospecting and the numerical differentiation of observational data. The talk will examine some of the mathematics which has been developed in the response to the need to solve the inverse problems arising from practical applications related to the payment of Australian farmers for their wheat, the smoothing of data using spline functions, and medical imaging. In this way, one obtains validation of the role and importance of MISG activities in that they identify practical problems for which either established mathematics must be viewed from a new perspective or entirely new mathematics is required.